Appendix A

Ian T Foster

Data Science and Learning Division
Argonne National Laboratory
Lemont, IL 60439-4843
Tel: (630) 252-4619
foster@anl.gov

Department of Computer Science
University of Chicago
Chicago, Illinois 60637
(773) 702 3487
foster@uchicago.edu

Education

1988   Doctor of Philosophy, Computer Science, Imperial College, University of London, United Kingdom. Advisor: Prof. Keith Clark.

1979   Bachelor of Science, 1st class honors, Computer Science, University of Canterbury, New Zealand

Current Positions

2021-   INRIA International Chair, Grenoble, France

2018-   Director, Data Science and Learning Division, Argonne National Laboratory (ANL)

2014-   Fellow, Institute for Molecular Engineering, University of Chicago (UC)

2010-   Argonne Distinguished Fellow, ANL

2004-   Arthur Holly Compton Distinguished Service Professor, UC

1998-   Senior Scientist, ANL

Other Professional Experience

2007-16   Senior Fellow, Institute on Genomic and Systems Biology, ANL and UC

2006-16   Director, Computation Institute, ANL and UC

2000-09   Associate Director, Mathematics and Computer Science Division, ANL

2000-04   Professor, Department of Computer Science, UC

1998-2017 Senior Fellow, Computation Institute, ANL and UC

1992-98   Scientist, Mathematics and Computer Science Division, ANL

1996-99   Associate Professor, Department of Computer Science, UC

1991-92   Assistant Scientist, Mathematics and Computer Science Division, ANL

1989-90   Postdoctoral Fellow, Mathematics and Computer Science Division, ANL

1985-88   Research Associate, Department of Computing, Imperial College

1983-84   Technical Consultant, BRS Europe

1980-82   Professional sailor, Pacific, Caribbean, Atlantic

Honors

2020   DOE Office of Science Distinguished Scientists Fellow

2020   IEEE-CS Goode Award

2019   Best Paper, SC'19 Supercomputing Conference

2019   IEEE-CS Charles Babbage Award

2018   R&D 100 Award for Swift

2018   Best Paper, International Conference on Machine Learning for Networking

2018   Best Paper, TridentCom 2018

2017   Euro-Par Achievement Award

2016   Best Paper Award, 18th IEEE Intl Conf on High Performance Computing and Comms

2016   Best Paper Award, 12th International Conference on eScience

2016   Distinguished Carl Adam Petri Lecture

2014   IEEE TCSC Award for Excellence in Scalable Computing

2012   Inaugural ACM High Perf. Distributed Computing Lifetime Achievement Award

2012	Technologist of the Year, Illinois Technology Association
2011	R&D 100 Award for Globus Online
2011	IEEE Tsutomu Kanai Award
2011	Best Paper Award, IEEE International Conference on Services Computing
2009	DSc (Honoris Causi), Research and Advanced Studies Center of the National Polytechnic Institute of Mexico (CINVESTAV), Mexico
2009	Fellow, Association for Computing Machinery
2009	WORLDCOMP Outstanding Achievement Award
2008	Professor Jean-Claude Healy Distinguished Lecture
2007	Data Analysis Challenge Award, SC07
2006	GridWorld "Industry Leadership Award"
2005	Network World's 50 Most Powerful People in Networking
2005	D.Sc (Honoris Causi), University of Canterbury, New Zealand
2003, 04	Silicon.com Top 50 Agenda Setter
2003	Fellow, American Association for the Advancement of Science
2003	R&D Magazine Innovator of the Year
2003	Illinois Innovation Award
2003	InfoWorld Innovator
2003	MIT Technology Review, one of "Ten Technologies That Will Change the World"
2003	University of Chicago Distinguished Service Award
2002	Federal Laboratory Consortium Technology Transfer Award
2002	Lovelace Medal
2002	Fellow, British Computer Society
2002	R&D100 "Most Promising New Technology" Award
2002	R&D 100 Award for Globus Toolkit
2001	Gordon Bell Award
1997	Global Information Infrastructure "Next Generation" Award
1995	Best Paper Award, Supercomputing Conference
1989	British Computer Society Award for Technical Innovation

Personal Data

U.S citizen, New Zealand citizen.

Languages: English (native), French (rusty)

Research

Throughout his career, Foster has pioneered new approaches to the use of distributed computing for accelerating scientific discovery, both within supercomputers and over networks. He has repeatedly proposed out-of-the-box ideas that proved transformative for computer science and DOE: ideas such as large-scale task-parallel programming, on-demand distributed computations ("grid computing"), virtual organizations, universal data transfer and trust fabrics, and cloud management services for data-intensive science.

High-level task parallelism: Parallelism has long meant, primarily, data parallelism and low-level message passing. Recognizing that many interesting task-parallel computations were difficult to realize with such tools, Foster developed new programming methods that eased the specification of interacting tasks, enabled composition of existing programs, used deterministic constructs to avoid race conditions, and scaled to large distributed and parallel computer systems. Tools such as Strand, Virtual Data Language, Swift, and most recently, Parsl have been used to develop pioneering implementations of task-parallel program structures—in areas as diverse instrument data analysis pipelines, large model intercomparisons, and hyper-parameter optimization—that

today are mainstream. Foster is exploring related problems within the exascale Codesign center for Online Data Analysis and Reduction project.

Grid computing: Noting the opportunities offered by high-speed networks in the 1990s, Foster ith colleagues Carl Kesselman and Steven Tuecke launched an effort to create a unifying fabric of protocols, software, and policies for remote and coordinated use of computers, data, instruments, and software, regardless of location: what came to be known as *grid computing*. (The idea was that one could request computing when needed, much like plugging into an electrical socket: a radical concept at the time, but now routine thanks to commercial clouds.) The realization of this vision required new methods for resource description and discovery; authentication, authorization, and delegation of authority; reliable, efficient data movement; distributed computation management; distributed system monitoring; and replication and indexing of distributed data. That work led to numerous technical advances, innovative applications, and improvements in scientific infrastructure. For example, the climate community uses these methods to distribute climate data used in IPCC assessments, and the HEP community to aggregate hundreds of thousands of CPUs contributed by hundreds of LHC participants worldwide. Data transfer, security, and workflow management methods developed in this work underpin the data infrastructure used by many science projects worldwide.

Cloud services for data-intensive science: Foster realized that the emergence of commercial ("public") cloud services offered exciting opportunities to rethink research infrastructure, in particular by offloading responsibility for previously manual processes to cloud-hosted services. The resulting Globus service provides managed identity management, data transfer and replication, data sharing, data publication, and other services to the research community. As of early 2020, Globus is used at 13 national laboratories and more than 1,000 institutions, has 250,000 registered users, and has been used to transfer more than 100 billion files and 1 exabyte. Globus has become an essential data infrastructure element at national computing and experimental facilities and within many science projects.

Network dynamics: Foster's interest in how networks are used has led to pioneering studies of the structure and dynamics of peer-to-peer networks; data replication and discovery strategies in distributed systems; innovation networks in science; the behavior of network protocols in low-loss networks; and behaviors within modern science networks.

Scientific applications: Foster has also made important contributions via the development of computational methods and infrastructures in climate science, biomedical science, x-ray imaging, materials science, and other fields.

Collaboration and Communication

Foster has conceived of and led numerous successful intralab, multilab, US, and international projects, from early grid initiatives to recent collaborations in network modeling and exascale co-design. He has worked with hundreds of scientists and engineers at national laboratories to advance science and infrastructure: for example, with HEP scientists on the creation and application of the computing infrastructure for the LHC; with climate scientists on parallel climate models and, later, the Earth System Grid; with materials scientists on online analysis for light sources; and with computational scientists on innovative distributed computing applications and technologies.

Foster is a tireless communicator and proponent of computational methods for science in his speaking and writing. His eight books have all been influential. For example, his 1994 text, *Designing and Building Parallel Programs*, the first book published on the web, has introduced

many to parallel programming; his 1998 and 2003 books on grid computing, with Carl Kesselman, defined a research agenda for a large community; and his 2016 book on *Big Data and Social Science* communicated advanced data science methods developed within DOE and elsewhere to government statistical agencies.

Selected Professional Activities

Chair/Organizer: ParCo (2019), IEEE Cloud (2016, 2017), CCGrid (2014), eScience (2012), NSF Workshop on Building Effective Virtual Organizations (2008), NSF Workshop on Virtual Organization Research (2007), International Provenance and Annotation Workshop (2006),Workshop on Data Annotation and Provenance (2002), IEEE International Symposium On High-Performance Distributed Computing (1998, 2000, 2001), IEEE Symposium on the Frontiers of Massively Parallel Computation (1999), DARPA/DOE/NASA/DOE Computational Grids Workshop (1997), DARPA/NSF Workshop on Performance (1996), DOE DP/ER Workshop on Public Key Infrastructure (1996), Interagency Workshop on the Peta ops Software Model (1996), Interagency Summer School on Petaops Software (1996), DOE DP/ER Workshop on Future Security Research (1995), 4th PDEs on the Sphere Conference (1994), Workshop on Parallel Algorithms for Semi-Lagrangian Transport (1994), NSF Workshop on High Performance Computing and Communications and Health Care (1994), Workshop on Task Parallelism in Fortran (1994).

Member: Computing Community Consortium (2018-), SLAC Board of Overseers (2017-2020); New Zealand National eScience Infrastructure Study Group (2015-); BESAC Subcommittee on Challenges at the Frontiers of Matter and Energy (2015); National Data Service Consortium Executive Committee (2015-); Joint DOE ASCAC/BERAC Subcommittee on Computational and Informational Technology Rate Limiters to the Advancement of Climate Change Science (2007); DOE ASCAC Subcommittee on the Role of Networking and Networking Research within the Office of Science (2007-2008); Open Grid Forum Advisory Committee (2002-2007), NSF Linked Environments for Atmospheric Discovery (LEAD) project External Advisory Committee (2003-2007); Canadian HPC Advisory Committee (2002-2003), IBM Autonomic Computing Council (2002-2003), Editorial Board, IEEE Internet Computing (since 2002), IIT Computer Science Advisory Board (2002-2004), UK eScience Technical Advisory Group (2001-2004), EU DataGrid Architecture Board (2001-2004), NSF CISE Advisory Committee, Subcommittee on Middleware (2000-2001); Editorial Board, IEEE Trans. on Parallel and Distributed Systems (1997-2002); Middleware Working Group, Next Generation Internet Symposium (1997); Advisory committee, IBM International Conference On Parallel Computing; Information Architecture Committee, Supercomputing '95; Advisory Panel, International Conference on High Performance Computing (1995-2000); Technical Steering Committee, NSF Center for Research on Parallel Computation (1992-2001); CHAMMP Science Team (1992-2001); Editorial Board, IEEE Parallel and Distributed Technology (1992-2001).

Books

1. **Big Data and Social Science**, I Foster, R Ghani, R Jarmin, F Kreuter, J Lane, eds., Taylor and Francis. Second edition, 2020.

2. **Parallel Computing: Technology Trends**, I Foster, G Joubert, L Kučera, eds., IOS Press, 2020.

3. **Cloud Computing for Science and Engineering**, I Foster and Dennis Gannon, CRC Press and at https://cloud4scieng.org, 2017.

4. **Big Data and Social Science**, I Foster, R Ghani, R Jarmin, F Kreuter, J Lane, eds., Taylor and Francis, 2016.

5.   **Transition of HPC towards Exascale Computing**, E D'Hollander, J Dongarra, I Foster, L Grandinetti, G Joubert, eds. IOS Press, 2013.

6.   **The Grid: Blueprint for a New Computing Infrastructure, 2ⁿᵈ Edition**, I Foster and C Kesselman, eds., Morgan-Kaufmann, 2004.

7.   **Sourcebook of Parallel Computing**, J Dongarra, I Foster, W Gropp, K Kennedy, L Torczon, A White, eds., Morgan-Kaufman, 2002.

8.   **The Grid: Blueprint for a New Computing Infrastructure**, I Foster and C Kesselman, eds., Morgan-Kaufmann, 1999.

9.   **Designing and Building Parallel Programs: Concepts and Tools for Parallel Software Engineering**, I Foster, Addison-Wesley and at http://www.mcs.anl.gov/dbpp/, 1995.

10. **Strand: New Concepts in Parallel Programming**, I Foster, S Taylor, Prentice-Hall, 1990.

11. **Systems Programming in Parallel Logic Languages**, I Foster, Prentice-Hall, 1989.

Journal Articles and Book Chapters (see scholar.google.com for latest)

12. "Productive parallel programming with Parsl," K Chard, Y Babuji, A Woodard, B Clifford, Z Li, M Hategan, I Foster, M Wilde, D Katz, **ACM SIGAda Ada Letters**, 40(2):73-75, 2021.

13. "Online data analysis and reduction: An important co-design motif for extreme-scale computers," I Foster, M Ainsworth, J Bessac, F Cappello, J Choi, S Di, Z Di, A Gok, H Guo, K Huck, XXX, **The International Journal of High Performance Computing Applications**, 2021.

14. "The Exascale Framework for High Fidelity coupled Simulations (EFFIS): Enabling whole device modeling in fusion science," E Suchyta, S Klasky, N Podhorszki, M Wolf, A Adesoji, Abolaji, C Chang, J Choi, P Davis, J Dominski, S Ethier, XXX., **The International Journal of High Performance Computing Applications**, 2021.

15. "Cyberinfrastructure and system software for online analysis of large-scale data: Challenges and design choices," R Kettimuthu, Z Liu, T Bicer, I Foster, **Handbook on Big Data and Machine Learning in the Physical Sciences: Volume 2. Advanced Analysis Solutions for Leading Experimental Techniques**,333-360, 2020.

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17. "Fast and accurate learned multiresolution dynamical downscaling for precipitation," J Wang, Z Liu, I Foster, W Chang, R Kettimuthu, V Kotamarthi, **Geoscientific Model Development Discussions**, 1-24, 2021

18. "Enabling deeper learning on big data for materials informatics applications," D Jha, V Gupta, L Ward, Z Yang, C Wolverton, I Foster, W Liao, A Choudhary, A Agrawal, **Scientific Reports**, 11(1): 1-12, 2021.

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35. "HACC cosmological simulations: First data release," K Heitmann, T Uram, H Finkel, N Frontiere, S Habib, A Pope, E Rangel, J Hollowed, D Korytov, P Larsen, B Allen, K Chard, I Foster, **The Astrophysical Journal Supplement Series**, 244(1):17, 2019.

36. "Virtual Excited State Reference for the Discovery of Electronic Materials Database: An Open-Access Resource for Ground and Excited State Properties of Organic Molecules." B Abreha, S Agarwal, I Foster, B Blaiszik, S Lopez, **The Journal of Physical Chemistry Letters** 10(21): 6835-6841, 2019.

37. "Jetstream: A novel cloud system for science," C Stewart, D Hancock, T Miller, J Fischer, L Liming, G Turner, J Lowe, S Gregory, E Skidmore, M Vaughn, D Stanzione, N Merchant, I Foster, J Taylor, P Rad, V Brendel, E Afgan, M Packard, T Miller, W Snapp-Childs, **Contemporary High Performance Computing**, 189-222, 2019.

38. "Reproducible big data science: A case study in continuous FAIRness," R Madduri, K Chard, M D'Arcy, S Jung, A Rodriguez, D Sulakhe, E Deutsch, C Funk, Cory, B Heavner, M Richards, P Shannon, G Glusman, N Price, C Kesselman, I Foster, **PloS One**, 14(4), e0213013, 2019.

39. "Workflow-based automatic processing for Internet of Floating Things crowdsourced data," R Montella, D Di Luccio, L Marcellino, A Galletti, S Kosta, G Giunta, I Foster, **Future Generation Computer Systems** 94, 103-119, 2019.

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42. "Matminer: An open source toolkit for materials data mining," L Ward, A Dunn, A Faghaninia, NER Zimmermann, S Bajaj, Q Wang, I Foster, **Computational Materials Science** 152, 60-69, 2018.

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45. "Bridging the gap between peak and average loads on science networks," S Nickolay, E.S Jung, R Kettimuthu, I Foster, **Future Generation Computer Systems** 79, 169-179, 2018.

46. "Advance reservation access control using software-defined networking and tokens," J Chung, ES Jung, R Kettimuthu, N.S.V Rao, I Foster, R Clark, H Owen, **Future Generation Computer Systems** 79, 225-234, 2018.

47. "The Modern Research Data Portal: A design pattern for networked, data-intensive science," K Chard, E Dart, I Foster, D Shifflett, S Tuecke, J Williams, **PeerJ Computer Science**, e144, 2018.

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49. "Characterizing agricultural impacts of recent large-scale US droughts and changing technology and management," J Elliott, M Glotter, A Ruane, K Boote, J Hatfield, J Jones, C Rosenzweig, L Smith, I Foster, **Agricultural Systems** 159:275-281, 2018.

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61.   "Globus Nexus: A Platform-as-a-Service provider of research identity, profile, and group management," K Chard, M Lidman, B McCollam, J Bryan, R Ananthakrishnan, S Tuecke, I Foster, **Future Generation Computer Systems**, 56:571-583, 2016.

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63.   "The Materials Data Facility: Data services to advance materials science research," B Blaiszik, K Chard, J Pruyne, R Ananthakrishnan, S Tuecke, I Foster. **Journal of Materials** 68(8):2045-2052, 2016.

64.   "Optimization of tomographic reconstruction workflows on geographically distributed resources," T Bicer, D Gürsoy, R Kettimuthu, F De Carlo, I Foster. **Journal of Synchrotron Radiation** 23:4, 2016.

65.   "Integrative genomics analyses unveil downstream biological effectors of disease-specific polymorphisms buried in intergenic regions," H Li, I Achour, L Bastarache, J Berghout, V Gardeux, J Li, Y Lee, et al. **NPJ Genomic Medicine** 1:16006, 2016.

66.   "Data publication with the structural biology data grid supports live analysis," P Meyer, S Socias, J Key, E Ransey, E Tjon, A Buschiazzo, et al. **Nature Communications** 7, 2016.

67.   "Networking materials data: Accelerating discovery at an experimental facility," I Foster, R Ananthakrishnan, B Blaiszik, K Chard, R Osborn, S Tuecke, M Wilde, J Wozniak, **Big Data and High Performance Computing**, 2015.

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622. "A High-Performance Parallel Theorem Prover," R Butler, I Foster, A Jindal, R Overbeek. In **10th International Conference on Automated Deduction**, 1990, pp. 649-650.

623. "Bilingual Parallel Programming," I Foster, R Overbeek. In **3rd Workshop on Parallel Languages and Compilers**, MIT Press, 1990.

624. "Experiences with Bilingual Parallel Programming," I Foster, R Overbeek. In **5th Distributed Memory Computer Conference**, 1990, pp. 1137-1146.

625. "Strand: A Practical Parallel Programming Tool," I Foster, S Taylor. In **North American Symposium on Logic Programming**, MIT Press, 1989, pp. 497-512.

626. "Parallel Implementation of Parlog," I Foster. In **International Conference on Parallel Processing**, Penn State University Press, 1988, pp. 9-16.

627. "Logic Operating Systems: Design Issues," I Foster. In **4th International Conference on Logic Programming**, MIT Press, 1987, pp. 910-926.

628. "A Declarative Environment for Concurrent Logic Programming," K Clark, I Foster. In **Lecture Notes in Computer Science**, vol. 251, Springer-Verlag, 1987, pp. 212-242.

629. "A Logical Treatment of Secondary Storage," I Foster, A Kusalik. In **Symposium on Logic Programming**, IEEE, 1986, pp. 58-67.

630. "A Sequential Implementation of Parlog," I Foster, S Gregory, G. Ringwood, K Satoh. In **Lecture Notes in Computer Science,** vol. 225, Springer Verlag, 1986, pp. 149-156.

Other Publications (Invited or Otherwise Unreviewed)

1. "The discovery cloud: Accelerating and democratizing research on a global scale," I Foster, K Chard, S Tuecke, **IEEE International Conference on Cloud Engineering**, pp. 68-77, 2016.

2. "Reasoning About Discovery Clouds", I Foster, **International Conference on Applications and Theory of Petri Nets**, 2016.

3. "Report on the International Provenance and Annotation Workshop (IPAW'06)," R Bose, I Foster, L Moreau, **SIGMOD Record**, September 2006, pp. 51-53.

4. "The Grid: Computing without Bounds," I Foster, **Scientific American**, April 2003, pp. 78-85.

5. "The Grid Grows Up," F Douglis, I Foster, IEEE Internet Computing, 7(4):24-26, 2003.

6. "Unexpected Consequences of Connections," Review of *Nexus* and *Linked*, **Science**, 08/16, 1124-1125, 2002.

7. "Computer Grids," I Foster, **Encyclopedia of New Media**, Moschovitis Group, 2002.

8. "The Anatomy of the Grid: Enabling Scalable Virtual Organizations," I Foster, **Lecture Notes in Computer Science,** vol. 2150, Springer-Verlag, 2001, pp. 1-4.

9. "The Anatomy of the Grid: Enabling Scalable Virtual Organizations," I Foster. **IEEE Conference on Cluster Computing and the Grid**, 15(3):200-222, 2001.

10. "Delphi: An Integrated, Language-Directed Performance Prediction, Measurement, and Analysis Environment," D Reed, D Padua, I Foster, D Gannon, B Miller. In **Frontiers '99**, 1999, pp. 156-159.

11. "The Globus Project: A Status Report," I Foster, C Kesselman, **Heterogeneous Computing Workshop**, 1998, pp. 4-18.

12. "Enabling Technologies for Web-Based Ubiquitous Supercomputing," I Foster, S Tuecke. **5th Symposium on High Performance Distributed Computing**, IEEE, 1996, pp. 112-120.

13. "An Overview of the Globus and I-WAY Projects," I Foster, **Conference of the Advanced School for Computing and Imaging**, Holland, 1996, pp. 17-20.

14. "High-Performance Distributed Computing: The I-WAY Experiment and Beyond," I Foster, **EUROPAR'96**, Lyon, France, 1996. Reprinted in **Australasian Conference on Parallel and Real-Time Systems**, 1996, pp. 1-10.

15. "Introduction to the Special Issue on Parallel Computing in Climate Modeling and Meteorology," J Drake, I Foster, **Parallel Computing**, 21(10):1539-1544, 1995.

16. "Language Constructs and Runtime Systems for Compositional Parallel Programming," I Foster, C Kesselman, **Lecture Notes in Computer Science,** vol. 854, Linz, Austria, Springer-Verlag, 1994, pp. 5-16.

17. "Libraries for Parallel Paradigm Integration," I Foster, M Xu, **Toward Teraop Computing and New Grand Challenge Applications**, ed. R Kalia, P Vashista, Nova Science Publishers, 1994, pp. 245-256.

18. "Parallel Language Constructs for Paradigm Integration and Deterministic Computations," K.M Chandy, I Foster. In **PARCO 93**, Grenoble, France, Springer-Verlag, 1993, pp. 3-12.

19. "Using Compositional Programming to Write Portable, High-Performance Parallel Programs," I Foster, C Kesselman, S Taylor. In **International Symposium on Logic Programming**, 1991, pp. 737-738.

Technical Reports (partial)

20. "OGSA Basic Execution Service Version 1.0," I Foster, A Grimshaw, P Lane, W Lee, M Morgan, S Newhouse, S Pickles, D Pulsipher, C Smith, M Theimer, Open Grid Forum GFD.108, 2007.

21. "OGSA WSRF Basic Profile 1.0," I Foster, T Maguire, D Snelling, Open Grid Forum GFD.72, 2006.

22. "Modeling Stateful Resources with Web Services," I Foster, J Frey, S Graham, S Tuecke, K Czajkowski, D Ferguson, F Leymann, M Nally, I Sedukhin, D Snelling, T Storey, W Vambenepe, S Weerawarana, www.globus.org/wsrf, 2004.

23. "From Open Grid Services Infrastructure to WS-Resource Framework: Refactoring & Evolution," K Czajkowski, D Ferguson, I Foster, J Frey, S Graham, T Maguire, D Snelling, S Tuecke, www.globus.org/wsrf, 2004.

24. "The WS-Resource Framework," K Czajkowski, D Ferguson, I Foster, J Frey, S Graham, I Sedukhin, D Snelling, S Tuecke, W Vambenepe, www.globus.org/wsrf, 2004.

25. "Web Services Resource Properties (WS-ResourceProperties) Version 1.1," S Graham, K Czajkowski, D Ferguson, I Foster, J Frey, F Leymann, T Maguire, N Nagaratnam, M Nally, T Storey, I Sedukhin, D Snelling, S Tuecke, W Vambenepe, S Weerawarana, www.globus.org/wsrf, 2004.

26. "Web Services Resource Lifetime (WS-ResourceLifetime) Version 1.1," J Frey, S Graham, K Czajkowski, D Ferguson, I Foster, F Leymann, T Maguire, N Nagaratnam, M Nally, T Storey, I Sedukhin, D Snelling, S Tuecke, W Vambenepe, S Weerawarana, www.globus.org/wsrf, 2004.

27. "Web Services Base Faults (WS-BaseFaults) Version 1.0," S Tuecke, K Czajkowski, J Frey, I Foster, S Graham, T Maguire, I Sedukhin, D Snelling, W Vambenepe, www.globus.org/wsrf, 2004.

28. "GridFTP Update January 2002," W Allcock, J Bresnahan, I Foster, L Liming, J Link, P Plaszczac. Globus Project, 2002.

29. "Global Grid Forum Management Groups and Structure," C Catlett, W Johnston, I Foster, Global Grid Forum GWD-C-1, 2001.

30. "Global Grid Forum Management Structure and Processes," C Catlett, W Johnston, I Foster, Global Grid Forum GWD-C-2, 2001.

31. "Global Grid Forum Status Report 2001," C Catlett, I Foster, Global Grid Forum GWD-1, 2001.

32. "An International Virtual-Data Grid Laboratory for Data Intensive Science," P Avery, I Foster, R Gardner, H Newman, A Szalay, GriPhyN-2001-2, 2001.

33. "Data Grid Reference Architecture," I Foster, C Kesselman, GriPhyN-2001-12, 2001.

34. "Representing Virtual Data: A Catalog Architecture for Location and Materialization Transparency," E Deelman, I Foster, C Kesselman, M Livny, GriPhyN-2001-14, 2001.

35. "The GriPhyN Project: Towards Petascale Virtual Data Grids," P Avery, I Foster, GriPhyN-2001-15, 2001.

36. "The NEES Equipment Site Point of Presence System (NEES-POP): Concept and Overview," R Butler, I Foster, C Kesselman, NEESgrid-2001-4, 2001.

37. "Network Policy and Services: A Report of a Workshop on Middleware," R Aiken, J Strassner, B Carpenter, I Foster, C Lynch, J Mambretti, R Moore, B Teitelbaum, IETF RFC 2768, 2000.

38. "Grid Forum: An Overview," C Catlett, I Foster, IEEE Distributed Computing Newsletter, 2000.

39. "Public Key Infrastructure for DOE Security Research," I Foster, W Johnston, LBL/TR, 1997.

40. "Proceedings of the PAWS and PetaSoft Workshops," T Sterling and I Foster (Eds), Caltech TR, 1996.

41. "Parallel Community Climate Model: Description and User's Guide," J Drake, R Flanery, I Foster, J Hack, J Michalakes, B Semeraro, D Williamson, P Worley, ORNL/TM-13271, 1996.

42. "Load-Balancing Algorithms for the Parallel Community Climate Model," I Foster, B Toonen, ANL/MCS-TM-190, 1995.

43. "Nexus User's Guide," I Foster, J Garnett, S Tuecke, ANL/MCS-TM-204, 1995.

44. "I-WAY Software Infrastructure User's Guide," I Foster, W Smith, Argonne, 1995.

45. "Programming in nPerl," I Foster, R Olson, Argonne, 1995.

46. "High Performance Fortran 2: Requirements Document," I Foster, R Schreiber (Eds), Rice University, 1995.

47. "The PORTS0 Interface," The PORTS Consortium, Argonne, 1994.

48. "Languages, Compilers, and Runtime Systems Support for Parallel Input-Output," A Choudhary, I Foster, G. Fox, K Kennedy, C Koelbel, J Saltz, M Snir, Caltech-CCSF-TR-94-40, California Institute of Technology, 1994.

49. "Workshop Report from the NSF Workshop on High-Performance Computing and Communications and Health Care," Co-author, Washington, D.C., 1994.

50. "Workshop Report from the Conference on Grand Challenge Applications and Software Technology," Co-author, Pittsburgh, 1993.

51. "Nexus: An Interoperability Layer for Parallel and Distributed Computer Systems," I Foster, C Kesselman, R Olson, S Tuecke, ANL-93/16, 1993.

52. "Fortran M Language Definition," I Foster, K.M Chandy, ANL-93/28, 1993.

53. "Programming in Fortran M," I Foster, R Olson, S Tuecke, ANL/93-26, 1993.

54. "Proceedings of a Workshop on the Earth's Climate as a Dynamical System," I Foster, H Kaper, M Kwong (Eds), ANL/MCS-TM-170, 1992.

55. "Proceedings of a Workshop on Data Systems for Parallel Climate Models," I Foster, M Henderson, R Stevens (Eds), ANL/MCS-TM-169, 1992.

56. "A Toolkit for Constructing Coupled Earth System Models," I Foster, ANL/MCS-TM-171, 1992.

57. "Proceedings of a Workshop on Compilation of Symbolic Languages," I Foster, E Tick (Eds), ANL-91/34, 1991.

58. "Parallel Programming with PCN," I Foster, S Tuecke, ANL/91-32, 1991.

59. "A Portable Run-time System for PCN," I Foster, S Tuecke, S Taylor, ANL/MCS-TM-137, 1990.

60. "The Program Composition Project," K.M Chandy, I Foster, C Kesselman, S Taylor, Caltech-CS-TR-90-03, California Institute of Technology, 1990.

61. "Generating Alignments of Genetic Sequences," R Butler et al., ANL/MCS-TM-132, 1989.

62. "Strand: The Language and its Implementation," I Foster, S Taylor, PAR 88/11, Dept of Computing, Imperial College, 1988.

63. "Strand Language Reference Manual," I Foster, S Taylor, PAR 88/10, Dept of Computing, Imperial College, 1988.

64. "The X Machine: A Proposal for Construction," F McCabe, I Foster, Dept of Computing, Imperial College, 1988.

65. "Compiling Parlog for the Sequential Parlog Machine," I Foster, PAR 86/3, Dept of Computing, Imperial College, 1986.

66. "Parlog Programming System: User Guide and Reference Manual," I Foster, PAR 86/6, Dept of Computing, Imperial College, 1986.

Invited Talks (partial)

"AI for Science at Argonne," **2nd NOAA Workshop on Leveraging AI in Environmental Science**, September 17, 2020.

"Agents in an Exponential World," Keynote talk at **Agent 2007: Complex Interaction and Social Emergence**, Northwestern University, Norris Center, Evanston, November 15, 2007.

"Virtual Environments for Learning," Keynote talk at **MacArthur/NSF Workshop on Virtual Environments**, Boulder, Colorado, November 9, 2007.

"Working Smarter," Keynote talk at **iSociety Conference**, Merrillville, Indiana, October 9, 2007.

"Technology for Distributed Collaboration," Invited talk at **Symposium on Digital Fabrication**, University of Chicago, Chicago, Illinois, August 23, 2007.

"System Level Science and System Level Models," Invited talk at **Energy Modeling Forum**," Snowmass, Colorado, August 1, 2007.

"Swift: Fast, Reliable, Loosely Coupled Parallel Computation," Keynote talk at **IEEE New Zealand Workshop in High Performance and Grid Computing**, Auckland, New Zealand, July 5, 2007.

"Looking to the Future," Keynote talk at **Kiwi Advanced Research and Education Network (KAREN) Workshop**, Auckland, New Zealand, July 3, 2007.

"Enabling Distributed Petascale Science," Plenary talk at **Scientific Discovery through Advanced Computing Conference**, Boston, Massachusetts, June 28, 2007.

"Grid: Enabling Open Science," Keynote talk at **Nature Conference on Asia Pacific Networks Promoting Excellence in Research**, Tokyo, Japan, June 6, 2007.

"Scaling eScience Impact," Keynote talk at **1st Iberian Cyberinfrastructure Conference**, Santiago de Compostela, Galicia, Spain, May 15, 2007.

"Scaling eScience Impact," Keynote talk at **German eScience Conference**, Baden Baden, Germany, May 2, 2007.

"Why Computer Science is Fundamental to (Almost) Everything," Keynote talk at **New Zealand Computer Science Students Research Conference**, Hamilton, New Zealand April 11, 2007.

"A Tutorial Introduction to Grid," **4th IFIP Summer School**, Gordons Bay, South Africa, March 28, 2007.

"Grid Technology and Multidisciplinary Science," Invited talk at **Virtual Observatories Conference, International Astronomical Union**, Prague, Czech Republic, August 21, 2006.

"The GriPhyN Virtual Data System," **Conference on High Performance Computing and Grids**, Cetraro, Italy, July 4, 2006.

"Education in the Science 2.0 Era," Invited talk at Workshop on SC Education Program, Argonne, Illinois, July 27, 2006.

"The Global Storage Grid -- Or, Managing Data for Science 2.0," Keynote talk at **14th NASA Goddard - 23rd IEEE Conference on Mass Storage Systems and Technologies**, College Park, Maryland, May 16, 2006.

"Global Data Services: Developing Data-Intensive Applications Using Globus Software," Tutorial at **14th NASA Goddard - 23rd IEEE Conference on Mass Storage Systems and Technologies**, College Park, Maryland, May 15, 2006.

"Cyberinfrastructure and the Role of Grid Computing—Or, Science 2.0," Keynote talk at **Geoinformatics 2006**, Reston VA, May 12, 2006.

"Grid Dynamics," Keynote Talk, **Global Grid Forum 16**, Athens, Greece, February 14, 2006.

"Service Oriented Science: Scaling eScience Application & Impact," Keynote, 1st International Conference on e-Science and Grid Computing, Melbourne, Australia, December 13, 2005.

"Globus Toolkit Version 4," Tutorial, **1st International Conference on e-Science and Grid Computing**, Melbourne, Australia, December 12, 2005 [and many other places].

"Grid: Why, What, How," **Chicago Technology Forum**, Chicago, Illinois, October 28, 2005.

"Grid Services Overview and Introduction," Keynote Talk, **OOSTech**, Baltimore, Maryland, October 26, 2005.

"A New Era in Computing: Moving Enterprise Services onto Grid," **VIP Grid Summit**, Chicago, Illinois, July, 2005.

"Enabling eScience: Grid Technologies Today & Tomorrow," **American Association for the Advancement of Science Annual Meeting**, Washington, DC, February 21, 2005.

"Globus: Bridging the Gap," Keynote Talk, **GlobusWORLD**, Boston, Mass., February 8, 2005.

"Empowering Distributed Science," **DOE National Collaboratories Meeting**, NCAR, Boulder, Colorado, December 2, 2004.

"The Grid: Beyond the Hype," Keynote talk at **3rd International Conference on Grid & Cooperative Computing**, Wuhan, China, October 21, 2004.

"Enabling eScience: Open Software, Standards, Infrastructure," Keynote talk at **UK eScience All Hands Meeting**, Nottingham, September 2, 2004.

"Brain Meets Brawn: Why Grid and Agents Need Each Other," Keynote talk at **3rd International Conference on Autonomous Agents and Multi Agent Systems**, New York USA, July 22, 2004.

"The Grid: Essential Infrastructure for DOE Science," **SciDAC PI Meeting**, Charleston, North Carolina USA, March 22, 2004.

"Grid Physics Network & International Virtual Data Grid Lab," **NSF Scalable Cyberinfrastructure Division PI Meeting**, February 18, 2004.

"Introduction to the Grid," **COMDEX 2003**, Las Vegas, Nevada USA, November 18, 2003.

"Open Grid Services Architecture," Tutorial, **APAC'03**, Queensland, Australia, September 29, 2003.

"How the Linux and Grid Communities can Build the Next Generation Internet Platform," Invited talk at **Ottawa Linux Symposium**, Ottawa, Canada, July 24, 2003.

"Data and the Grid: From Databases to Global Knowledge Communities," Keynote talk at **15th International Conference on Scientific and Statistical Database Management** (SSDBM 2003), Cambridge, MA, USA, July 11, 2003.

"The Grid: The First 50 Years," **British Computer Society**, Lovelace Medal Award Presentation, London, May, 2003.

"Security and Certification Issues in Grid Computing," Keynote at **International Workshop on Certification and Security in E-Services** (CSES 2002), Montreal, Canada, August 28, 2002.

"Future Scientific Infrastructure," Keynote at **QUESTnet**, Gold Coast, Australia, July 4, 2002 (9 MB) [Powerpoint]

"Future Scientific Infrastructure," Keynote at **DAS-2 Conference**, Amsterdam, June 6, 2002.

"Virtual Data and the Chimera System," **HPC 2002 Conference**, Cetraro, Italy, June 25, 2002.

"The Grid and the Future of Business," Keynote at **Delphi Web Services Conference**, San Jose, CA., May 22, 2002.

"The Grid: Enabling Resource Sharing within Virtual Organizations," Keynote at **World Wide Web Conference 2002**, Honolulu, Hawaii, May 9, 2002.

"Grid Computing: Concepts, Applications, and Technologies," Tutorial at **Grid Computing in Canada Workshop**, Edmonton, Canada, May 1, 2002.

"Data Grids and Data Intensive Science," Keynote at **Research Library Group Annual Conference**, Amsterdam, Netherlands, April 22, 2002.

"Grid Computing and Web Services: A Natural Partnership," **Euromicro Workshop on Parallel, Distributed, and Network Computing**, Gran Canaria, January 2002. (Keynote.)

"The Anatomy of the Grid: Enabling Scalable Virtual Organizations," **AURORA International Workshop on Grid Computing**, Vienna, Austria, December 2001. (Keynote.)

"Securing the Grid and other Middleware Challenges," **NSF Workshop on Grand Challenges in eScience**, Chicago, Ill., December 2001.

"Realizing the Promise of Grid Computing," **NSF Advisory Committee on Cyberinfrastructure**, Washington, DC (via Access Grid), November 2001.

"SC Global: Celebrating Global Science," **SC'2001 Masterworks Presentation**, Denver, Col., November 2001.

"Grid Computing," **Sun HPC Consortium Conference**, Denver, Col., November 2001. (Keynote.)

"Grid Computing," **IBM Advanced eBusiness Conference**, Austin, Texas, October 2001.

"Keeping Grid Projects Coherent," **EU DataGrid Industry Forum**, Frascati, Italy, October 2001.

"Grid Computing: Architecture and Achievements," **CHEP'2001**, Beijing, China, September 2001. (Plenary.)

"The Anatomy of the Grid: Enabling Scalable Virtual Organizations," **Euro-Par 2001**, Brisbane, Australia, August 2001. (Keynote.)

"Globus Project Current Status," **Globus Retreat**, San Francisco, August 2001

"Grids and Grid Technologies," **OMG Workshop on the Grid**, Boston, July 2001.

"The Earth System Grid Project," **Global Grid Forum 2**, Washington, DC, July 2001.

"U.S Grid Projects," **Upperside Conference on Industrial Grids**, Paris, June 2001. (Keynote.)

"Parallel Computing in 2001," **PPoPP 2001**, Snowbird, June 2001. (Keynote.)

"The Anatomy of the Grid: Enabling Scalable Virtual Organizations," **IEEE Conference On Cluster Computing and the Grid** (CCGrid), Brisbane, Australia, May 2001. (Keynote.)

"The GriPhyN Project," **Alliance All-Hands Meeting**, Urbana, May 2001.

"Grids: Past, Current, Future Activities," **European Union Grid Summit**, Brussels, March 2001.

"Middleware," **Access Grid Retreat**, Argonne, January 2001.

"Middleware and Grids," **NSF Middleware Panel**, December 2000.

"The Grid Forum," **Intel Peer-to-Peer Conference**, San Jose, October 2000.

"Grid Computing," **ACAT Conference**, FermiLab, October 2000. (Plenary.)

"Grid Architecture," **Grid Forum 5**, Boston, October 2000. (Keynote.)

"MPICH-G2: A Grid-Enabled MPI," **NASA Information Power Grid Workshop**, San Jose, September 2000.

"Designing and Building Parallel Climate Models," **Computational Science and Engineering Symposium**, Urbana, April 1997. (Keynote.)

"Autoconfiguration in Heterogeneous Clusters," **Cluster Computing Conference**, Altanta, February 1997. (Keynote.)

"High-Performance Distributed Computing: The I-WAY Experiment and Beyond," **PART '96**, Brisbane, Australia, August 1996. (Keynote.)

"High-Performance Distributed Computing: The I-WAY Experiment and Beyond," **EUROPAR '96**, Lyon, France, August 1996. (Keynote.)

"Ubiquitous Supercomputing," **ASCI '96**, Holland, June 1996. (Keynote.)

"The I-WAY and Globus Projects," **International Conference on Supercomputing**, Philadelphia, May 1996.

"Multithreading and High-Performance Computing," **European School on High Performance Computing**, Alpes d'Huez, France, April 1996.

"Parallel Algorithms for Climate Models," **Annual Meeting of the French SIAM**, Grenoble, France, March 1996.

"Task and Data Parallelism," **Spring School on Data Parallelism**, Les Menuires, France, March 1996.

"Runtime Support for Parallel Object-Oriented Languages," **Workshop on Parallel Object-Oriented Programming,** Southampton, England, March 1996.

Seminars (partial)

"Swift: Fast, Reliable, Loosely Coupled Parallel Computation," Lecture at Leibniz-Rechenzentrum München, Munich, Germany, April 30, 2007.

"Why Computer Science is Fundamental to (Almost) Everything," Arthur Schoffstall Lecture, Renssellaer Polytechnic Institute, Troy, NY, April 19, 2007.

"Service Oriented Science: Scaling eScience Application & Impact," Distinguished Lecture, Purdue University, February 6, 2006

"Service Oriented Science: Scaling eScience Application & Impact," Distinguished Lecture, Northeastern University, Boston, January 26, 2006.

"The Grid: Reality, Technologies, Applications," Distinguished Lecture, McGill University, Montreal, Canada, January 21, 2005.

"The Grid and its Implications for Science (and Industry)," Royal Society of New Zealand, Wellington, New Zealand, March 18, 2004.

"The Grid: Opportunities, Achievements, and Challenges for (Computer) Science," University of Canterbury, Christchurch, New Zealand, March 17, 2004.

"An Open Grid Services Architecture," Indiana University, January 2002.

"The Anatomy of the Grid: Enabling Scalable Virtual Organizations," University of Edinburgh, December 2001.

"The Anatomy of the Grid: Enabling Scalable Virtual Organizations," U. Florida, Gainesville, FL, November 2001. (Distinguished HPC Seminar.)

"Grid Computing and Applications," FermiLab, Batavia, IL, October 2001.

"Grid Technologies and Applications: Architecture and Achievements," CERN, Geneva, August 2001.

"Grid Computing," CERN, Geneva, January 2001.

"The Globus Toolkit," IBM Yorktown, December 2000.

"The GARA Quality of Service Architecture," Cisco, San Jose, April 2000.

"High-Performance Computational Grids," University of Tennessee, October, 1997; University of California at Berkeley, October 1997.

"Network-Based Approaches to Supercomputing," Lawrence Berkeley National Laboratory, July 1996; University of California at San Diego, December 1996; California Institute of Technology, April 1997.

"High-Performance Distributed Computing: The I-WAY Experiment and Beyond," University of Nebraska, March 1996.

"Ubiquitous Supercomputing," University of Chicago, April 1996.

"High-Performance Distributed Computing: The I-WAY Experiment and Beyond," Politechnico di Milano, January 1996.

"Software Infrastructure for High-Performance Distributed Computing," University of Illinois, November 1994.

"A Massively Parallel Atmospheric Model Testbed," Microelectronics Center of North Carolina, April 1994.

"Modular Parallel Programming," University of California at Los Angeles; NASA Langeley Research Center; UT Austin; 1993.

"Fortran M: A Language for Modular Parallel Programming," Intel Corporation, Portland, Ore., July 1993.

"Deterministic Parallel Programming Languages," Harvard University; Thinking Machines Corporation; Jan. 1993.

"Information Hiding in Parallel Programs," California Institute of Technology; UC Santa Barbara; U. Illinois at Urbana-Champaign; Imperial College; 1992.

"Software Engineering Issues in Parallel Climate Models," ICIAM '91, Washington, D.C., 1991.

"Parallel Algorithms for Computing the Spectral Transform," California Institute of Technology, 1991.